DRAFT 11/1/95

Conceptual Models

of the

Mission Space

(CMMS)

Management Plan

Conceptual Models of the Mission Space (CMMS) Management Plan

1. INTRODUCTION

1.1. Vision. Conceptual models of the mission space (CMMS) will provide simulation developers with a common starting point for constructing consistent and authoritative M&S representations. The primary purpose of CMMS are to facilitate interoperability and reuse of simulation components, particularly among DoD simulation developments. The sharing of common, authoritative information between DoD simulations is a necessary condition for interoperability. However, even when two simulations share a common view of the world, the two simulations may still not necessarily inteoperate if their level of resolution is vastly different from each other. CMMS will provide a meta-model of fundamental knowledge about military operations. The CMMS System will facilitate the capture of this knowledge, store it, manage it, and make it easily accessible to all parties involved in simulation development and other interested users. It will also provide links to more detailed information and data.

1.2. General Execution. The Defense Modeling and Simulation Office (DMSO) will

- develop and field a CMMS System (a technical framework and infrastructure) that facilitates CMMS's use by simulation developers, authoritative sources, and others.
- identify authoritative sources of information for CMMS,
- provide a mechanism for coordination and cooperation in Service and joint agency knowledge acquisition efforts,
- incorporate information from independent knowledge acquisition efforts into the CMMS System,
- plan for and enable the validation by authoritative sources of CMMS information, and
- develop and maintain CMMS management processes, software and interface tools for simulation developers, warfighters, and other users.

1.3. Background.

1.3.1. The simulation development process involves a flow of information from the real world to a simulation. As a part of this process, developers start with an understanding of how DoD performs its mission and select the parts of the real world they need to represent, as well as their level of resolution. Today, this analysis is repeated for each new model or simulation system. Once each project is finished, the carefully collected and organized real world knowledge is usually lost or buried deep within the computer code making up the simulation.

1.3.2. CMMS are first abstractions of the real world and serve as a frame of reference for simulation development by capturing the basic information about important entities involved in any mission and their key actions and interactions. CMMS are simulation-neutral views of those entities, actions, and interactions occurring in the real world.

1.3.3. CMMS are bridges between the warfighter, who owns the combat process and serves as the authoritative source for validating CMMS content, and simulation developers. Additionally, CMMS provide a common viewpoint and serve as a vehicle for communications among warfighters, doctrine developers, trainers, C4I developers and analysts. Such a foundation allows all concerned parties to be confident that DoD simulations are founded in solid, warfighting realism.
1.3.4. CMMS System(s) serve as the means for capturing, sharing, and evolving this highly reusable knowledge. CMMS will remain independent of specific applications by addressing the superset of entities, actions, and interactions occurring in any mission space, before the simulation developer makes decisions for the particular simulation to ignore, instantiate, or abstract for that development.

2. MANAGEMENT PLAN OBJECTIVES

2.1. The CMMS Management Plan provides the roadmap for CMMS System development. The plan identifies the process by which individual components will be developed and how components will be integrated to form a CMMS System. The CMMS Management Plan will include:

- Section 1. Introduction - provides the CMMS System vision, background information, and DMSO's view of the CMMS System.
- Section 2. Management Plan Objectives - establishes objectives for the CMMS System management plan.
- Section 3. Development of Individual Components - defines the approach for developing the individual parts of the CMMS System.
- Section 4. Integration of System Components - defines the approach for integrating the components and how users will be involved.
- Section 5. Monitoring and Evaluating Progress - defines the management processes to be used in each phase of the CMMS System development.
- Section 6. Schedule and Responsibilities - establishes the schedule and assigns responsibilities for developing the CMMS System.

3. DEVELOPMENT OF INDIVIDUAL COMPONENTS

3.1. CMMS. CMMS System development will occur in three phases:
3.1.1. Exploration Phase. There will be several CMMS experiments for the purpose of exploring the CMMS concept and to define the requirements of CMMS System components. A set of general requirements (see Appendix) will focus experimenters on research that will lead to a solid technical foundation for prototype and final CMMS development.
3.1.2. Prototype Phase. The requirements for the prototype will be derived from the Exploration phase. The prototype will focus on a single mission space, such as conventional combat operations. It will rely on knowledge inputs from past simulations and on-going simulation developments. Simulation developers may voluntarily build conceptual models in accordance with the CMMS System technical framework and provide them to the prototype effort.

Data collected during independent knowledge acquisition may also be converted for integration into CMMS. The CMMS System prototype will be tested to insure sufficient compliance of the general requirements.

3.1.3. Final System Phase. A final System will be designed and built. Population by simulation developers and authoritative sources will continue. A configuration management process will be developed into final form that ensures consistency and completeness. During this phase, knowledge acquisition and engineering for additional mission spaces will be initiated and the knowledge gained from these experiences will be used to evolve the requirements for the CMMS System components.

3.2. User Interface. The user interface will be evolutionary. The initial users are the DoD simulation developers; subsequently users will include Warfighters. There will be two phases to the evolutionary process:

3.2.1. Phase one: Early experiments will define user requirements for a standard interface for the prototype CMMS System.

3.2.2. Phase two: An evolutionary user interface will be developed during prototype development. It will be adapted to changing user needs and changes in CMMS System content and structure.

3.3. CMMS System Management Process.

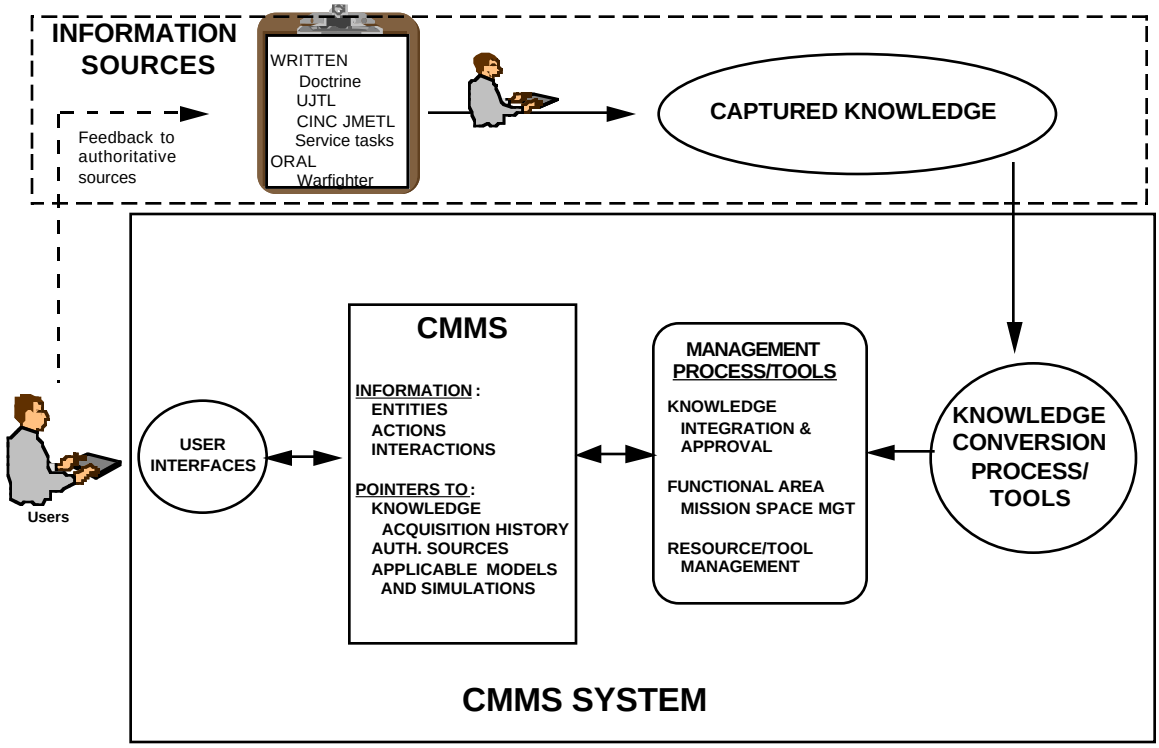
3.3.1. A configuration management process will be developed during the CMMS prototype phase. The amount and breadth of information involved, coupled with validation and update requirements, make the configuration management process potentially very difficult. The configuration management process will be developed to provide consistency and completeness in the evolution of a CMMS System. As information in the real world changes (e.g. doctrine, organization), the CMMS System will enable the timely update, revalidation, and dissemination of these changes by validation proponents. The configuration management process will ensure that information is validated by authoritative sources. It tracks the validation process and records the history of each validation.

3.3.2. A migration process will provide a roadmap for the evolutionary growth of the CMMS System. The CMMS representation of the real world will change as the real world changes. Additionally, CMMS will grow slowly over time as various parts of the real world are addressed in simulation. Well-ordered migration plans will be developed under the migration process to even out the integration effort.

3.3.3. A CMMS System Management process will be implemented to plan for the improvement of CMMS System content and form, as well as for the orderly evolution of the individual components of the system.

3.3.4. A user involvement process will provide a structured method for CMMS System users to be involved in the control and evolution of the CMMS System. At a minimum, it will outline the structure and procedures for establishing and maintaining a CMMS User’s Group.

CMMS Process



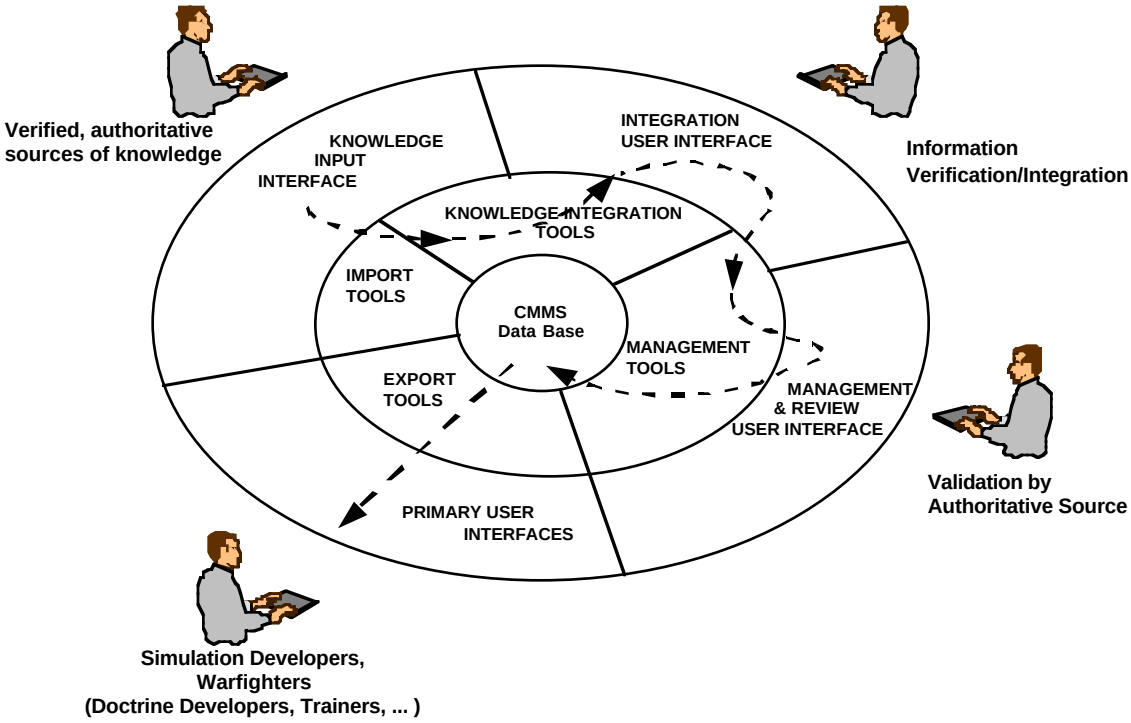
4. INTEGRATION OF CMMS SYSTEM COMPONENTS

4.1 The key to efficient integration of CMMS knowledge is a comprehensive technical framework. The purpose of the technical framework is to make a CMMS System that is efficient and effective. Continual feedback of users is crucial to providing a value-added capability to system developers and other CMMS System users.

4.2. Technical Framework.

4.2.1. A draft technical framework will be completed early in the CMMS System development. This draft framework will allow CMMS experimenters to compare and contrast their different approaches, while fulfilling the minimal requirements for the CMMS System. It will also help DMSO better understand the problems associated with defining and maintaining a technical framework. The final framework will allow simulation developers to capture mission space knowledge using a diverse set of tools, and still ensure that the knowledge can be transformed to a common format for input to a common user interface. The stable underlying information structure is the “conceptual” view of the CMMS System. The user interface will provide several “external” views tailored to user requirements.

CMMS System



4.2.2. The technical framework must support the configuration management, migration management and system management processes. The iterative method envisioned for the development of the technical framework is to first develop a strawman technical framework. CMMS experimenters will attempt to build a CMMS System consistent with the strawman. The experimenters will list problems and recommend actions for a new draft.

4.3. User Involvement.

4.3.1. User involvement starts with demonstrations of the CMMS System experiments. Users will be asked for comments and suggestions on the CMMS content and the experimental system user interfaces. Users will provide DMSO feedback on the appropriate level of detail of the information that should be contained in the CMMS.

4.3.2. CMMS System developers will continue to seek feedback from User Group during the Prototype Phase and continuing through the Final Phase.

5. MONITORING AND EVALUATING PROGRESS

5.1. Exploration Phase.

5.1.1. During the Exploration phase, the management emphasis will allow the contractors to develop new concepts and “think through the problem.”

5.1.2. As part of the monitoring and evaluation effort, DMSO will meet with each contractor as appropriate. DMSO will provide guidance and assist in disseminating information among the contractors and to interested users.

DMSO will focus on receiving feedback from experimenters on attempts to use the current draft technical framework.

5.2. Prototype Phase.

5.2.1. During this phase, the prototyping concept will dominate the approach and the Government will not require detailed design documents. However, the contractor(s) will be required to submit plans and schedules with milestones that include formal Government review and approval. There will be progress checks to ensure that the goals and objectives are still achievable within the funding and schedule constraints.

5.2.2. Before or during the Prototype Phase, the contractor(s) will be required to provide:

1) a concept definition,
2) a development schedule,
3) a plan for including users in the prototyping process,
4) technical reviews as agreed to in the contracts,
5) management reviews as agreed to in the contract(s),
6) documentation for all software components of the prototype, and
7) training classes.

5.3. Final System Development Phase.

5.3.1. This phase will concentrate on the operational aspects of the CMMS System. DMSO will monitor users' acceptance of the CMMS. The knowledge acquisition process used by simulation developers will also be monitored. The metrics to be used during the monitoring and evaluation of this phase will be developed prior to its start.

5.3.2. There will be contractors assigned to perform configuration control of the CMMS System. There will be a standard set of reviews to ensure that the contractor is performing the required tasks in a satisfactory manner.

6. SCHEDULE AND RESPONSIBILITIES.

6.1. Schedule.

6.1.1. Actions accomplished:

Aug 95

- Approval of Exploration experiment funding.
- Initial meeting of CMMS management level group (O-6) to gain consensus among DMSO, JSIMS, JWARS, STOW, and J-7 on need for coordinated knowledge acquisition actions. Further, it was clearly specified that DMSO involvement will provide value to individual knowledge acquisition efforts and not hinder program schedules. Quarterly update meetings will occur.
- Initial meeting of CMMS technical user group from DMSO, JSIMS, JWARS, STOW, and J-7. This group of individual program knowledge acquisition leaders will compare ideas and initiatives to reduce redundancy and increase interoperability. Periodic meetings are planned during CMMS exploration and prototype phases.
- DMSO CMMS IPR provided to Director, DMSO.

- Experiment development team (DMSO representatives and contractors) met and plan to meet monthly after start of experiments. Simulation developers invited but not required.

Sep 95 - Started CMMS experiments.

6.1.2. Project Milestones.

Oct 95 - Complete draft CMMS Management Plan, initial list of authoritative sources, and draft CMMS TF.

Nov 95 - Complete Final CMMS Management Plan. Begin research and development of contract vehicle that allows contractor start of initial CMMS System prototype in Apr 96.

Jan 96 - Complete CMMS System experiments.

Feb 96 - Complete CMMS Technical Framework.

Apr 96 - Start initial CMMS System prototype.

Dec 96 - Complete initial CMMS System prototype.

Apr 97 - Start building final CMMS System.

Oct 97 - Complete final CMMS System

Nov 97 - CMMS System Operational

6.2 Responsibilities.

6.2.1. Exploration Phase.

Define experiments - DMSO

Plan and perform experiments - Contractors

Monitor contractor progress - DMSO

Ensure user involvement - DMSO

Define and redefine CMMS System Technical Framework - DMSO

6.2.2. Prototype Phase.

Define requirements and write Request For Proposal (RFP) for CMMS System prototype - DMSO

Evaluate proposals and select contractor - DMSO

Design and build CMMS System prototype - Contractor

Monitor contractor progress - DMSO

Ensure user involvement - DMSO

Develop configuration management plan - Contractor

Approve and accept configuration management plan - DMSO

Develop generic CMMS migration process - Contractor

Approve and accept generic CMMS migration process - DMSO

Develop generic CMMS System management process - Contractor

Approve and accept generic CMMS System management process - DMSO

Evaluate CMMS System Prototype success and recommend Go/No-Go on Phase Final CMMS System - DMSO

6.2.3. Final CMMS System Phase

Capture and provide knowledge acquired from the combat operations mission space - simulation developers.

Translate knowledge as required with translation tools - Contractor

Integrate new knowledge into CMMS System information base in accordance with the configuration management plan -Contractor

Promote and coordinate Service and agency migration to CMMS using the migration management process - DMSO
Maintain the CMMS System in accordance with the configuration management plan - Contractor
Monitor CMMS System knowledge acquisition process - DMSO

Identify new CMMS System requirements - DMSO

Monitor and assess technology related to CMMS - DMSO

Appendix 1

CRITICAL ISSUES FOR EXPERIMENT PHASE

1. Provides views for all users.

2. Applies across the broad scope of DoD activities.

3. Supports translation from multiple KA approaches.

4. Allows newly selected models to use information already in CMMS System.

5. Adjusts when schema changes.